



GRADE

8

# KENTUCKY

K-PREP

Kentucky Performance Rating For Educational Progress



## MATH SAMPLE ITEMS

Spring 2013

The following are the general guides that will be used to evaluate your responses to short-answer and extended-response questions in this test.

## Kentucky Short-Answer Questions General Scoring Guide

### Score Point 2

- You complete all components of the question and communicate ideas clearly.
- You demonstrate an understanding of the concepts and/or processes.
- You provide a correct answer using an accurate explanation as support.

### Score Point 1

- You provide a partially correct answer to the question and/or address only a portion of the question.
- You demonstrate a partial understanding of the concepts and/or processes.

### Score Point 0

- Your answer is totally incorrect or irrelevant.

### Blank

- You did not give any answer at all.

# Kentucky Extended-Response Questions

## General Scoring Guide

### Score Point 4

- You complete all important components of the question and communicate ideas clearly.
- You demonstrate in-depth understanding of the relevant concepts and/or processes.
- Where appropriate, you choose more efficient and/or sophisticated processes.
- Where appropriate, you offer insightful interpretations or extensions (generalizations, applications, analogies).

### Score Point 3

- You complete most important components of the question and communicate clearly.
- You demonstrate an understanding of major concepts even though you overlook or misunderstand some less-important ideas or details.

### Score Point 2

- You complete some important components of the question and communicate those components clearly.
- You demonstrate that there are gaps in your conceptual understanding.

### Score Point 1

- You show minimal understanding of the question.
- You address only a small portion of the question.

### Score Point 0

- Your answer is totally incorrect or irrelevant.

### Blank

- You did not give any answer at all.

# KENTUCKY MATHEMATICS REFERENCE SHEET

## Grades 7 and 8

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### FORMULAS FOR PLANE FIGURES

Parallelogram:  $A = bh$

Trapezoid:  $A = \frac{1}{2}(b_1 + b_2)h$

Triangle:  $A = \frac{1}{2}bh$

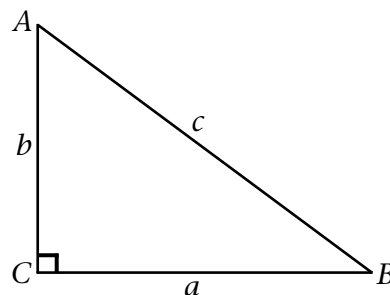
Circle:  $C = 2\pi r$

$$A = \pi r^2$$

Right Triangle:

The Pythagorean Formula

$$c^2 = a^2 + b^2$$



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### FORMULAS FOR SOLID FIGURES

Right Prism:  $V = Bh$  ( $B$  is the area of the base.)

Right Cylinder:  $V = \pi r^2 h$

Regular Pyramid:  $V = \frac{1}{3}Bh$

Cube:  $V = e^3$

$$SA = 6e^2$$

Cone:  $V = \frac{1}{3}\pi r^2 h$

Sphere:  $V = \frac{4}{3}\pi r^3$

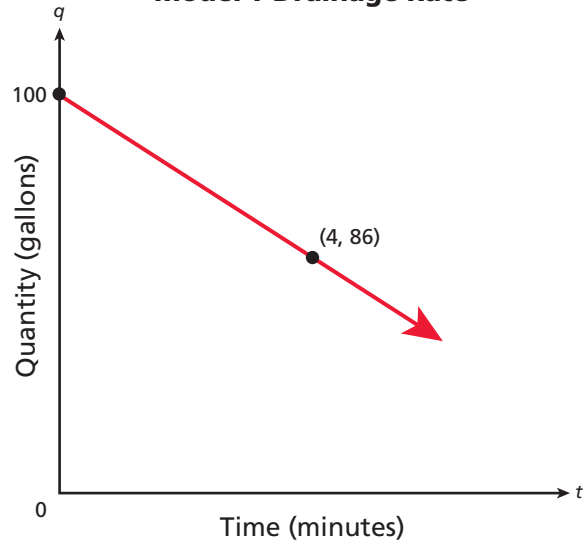


1

A farmer has two water tanks that drain at a rate of 2.5 gallons per minute. He is considering replacing the existing tanks with new ones, either Model S or Model T. Information about the new tanks is shown below. Each tank holds 100 gallons of water and drains at a constant rate.

**Model S Drainage Rate**

Time (minutes)	Quantity (gallons)
0	100
6	82

**Model T Drainage Rate**

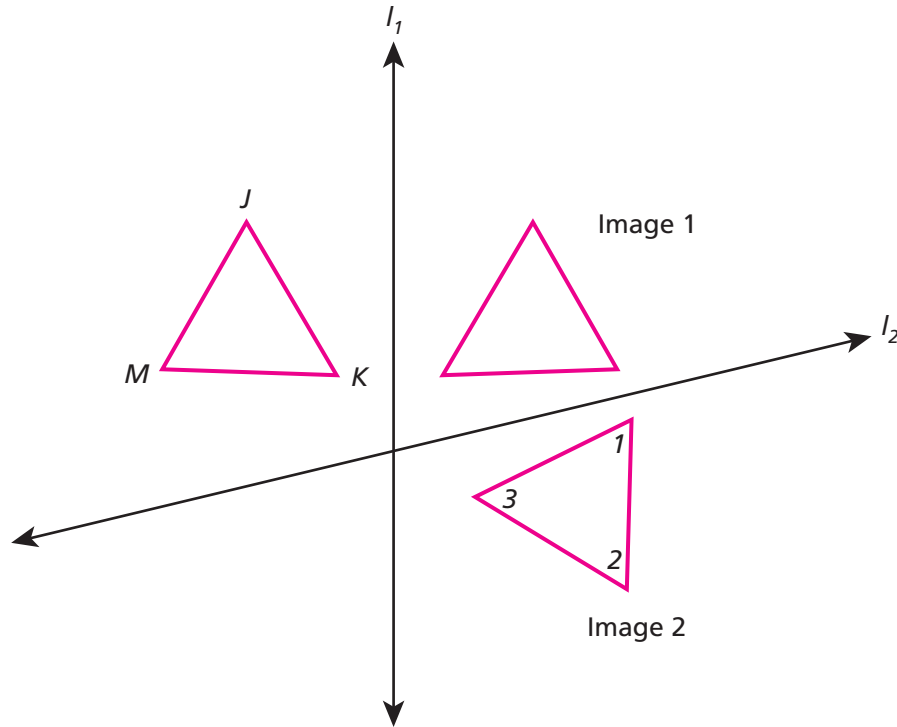
Which statement below is true about the drainage rates of the new tanks?

- A** Both Model S and Model T drain faster than the existing tanks.
- B** Both Model S and Model T drain slower than the existing tanks.
- C** Model S drains faster and Model T drains slower than the existing tanks.
- D** Model S drains slower and Model T drains faster than the existing tanks.



2

In the diagram below, Image 2 is a triangle that is the result of reflecting scalene  $\triangle JKM$  first over  $l_1$  and then over  $l_2$ .



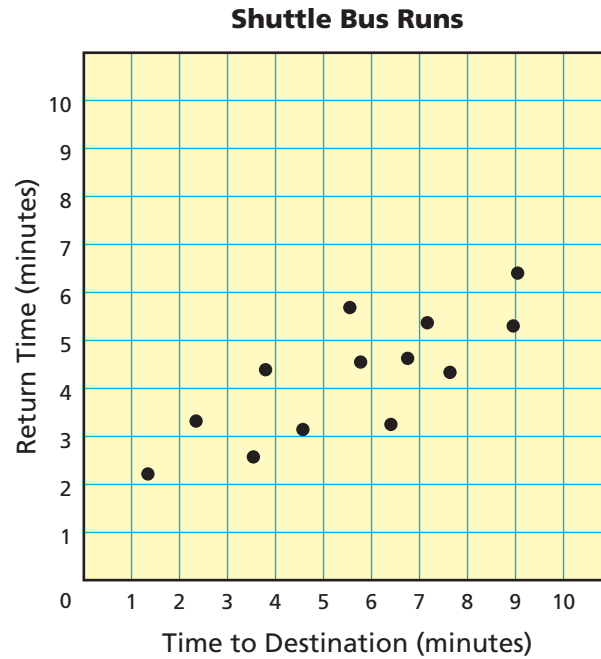
The angles of Image 2 are  $\angle 1$ ,  $\angle 2$ , and  $\angle 3$ . Which one of the following is true?

- A**  $\angle J \cong \angle 1$  and  $\angle M \cong \angle 3$
- B**  $\angle J \cong \angle 3$  and  $\angle M \cong \angle 1$
- C**  $\angle K \cong \angle 1$  and  $\angle M \cong \angle 3$
- D**  $\angle K \cong \angle 3$  and  $\angle M \cong \angle 1$



3

An airport terminal runs shuttle buses to different parts of the airport. The scatter plot shows the times for each part of the airport and a number of round trips.



Which equation is closest to the line of best fit for this data?

- A**  $y = \frac{3}{5}x + 1$
- B**  $y = \frac{3}{2}x + 1$
- C**  $y = \frac{3}{4}x + 2$
- D**  $y = \frac{5}{4}x + 2$



4

Pam and Kate will walk along the same path from the same starting point, and in the same direction.

- By the time Pam starts walking, Kate is 60 feet ahead of her.
- Pam walks at a constant rate of 25 feet every 7 seconds.
- Kate walks  $\frac{1}{2}$  as fast as Pam.

How many seconds does it take for Pam to catch up to Kate?

- A** 35.3
- B** 33.6
- C** 22.4
- D** 16.8

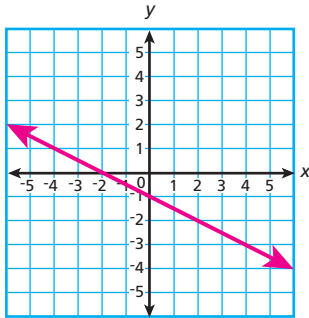




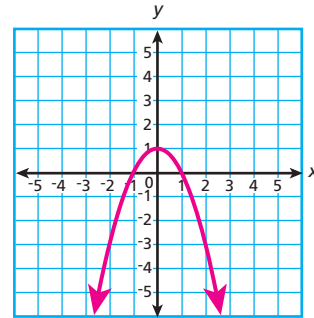
5

Which graph represents the equation below?

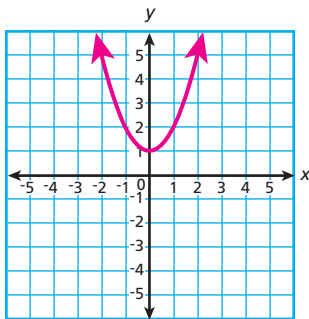
$$y = -2x + 1$$



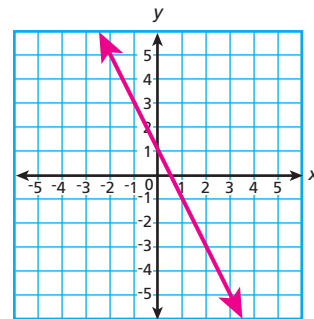
**A**



**C**



**B**



**D**



6

A student is comparing three cylinders. The dimensions of the three cylinders are listed below.

- First cylinder has a height of 9 inches and a diameter of 4 inches.
- Second cylinder has a height of 3 inches and a diameter of 4 inches.
- Third cylinder has a height of 9 inches and its volume is  $\frac{1}{4}$  the volume of the first cylinder.

**Part A** How does the volume of the second cylinder compare to the volume of the first cylinder? Explain your answer using the formula for the volume of a cylinder.

**Part B** How does the diameter of the third cylinder compare to the diameter of the first cylinder? Explain your answer.



RUBRIC	
<b>Score Point 2</b>	<ul style="list-style-type: none"> <li>You complete all components of the question and communicate ideas clearly.</li> <li>You demonstrate an understanding of the concepts and/or processes.</li> <li>You provide a correct answer using an accurate explanation as support.</li> </ul>
<b>Score Point 1</b>	<ul style="list-style-type: none"> <li>You provide a partially correct answer to the question and/or address only a portion of the question.</li> <li>You demonstrate a partial understanding of the concepts and/or processes.</li> </ul>
<b>Score Point 0</b>	<ul style="list-style-type: none"> <li>Your answer is totally incorrect or irrelevant.</li> </ul>
<b>Blank</b>	<ul style="list-style-type: none"> <li>You did not give any answer at all.</li> </ul>
<b>Note:</b> No part can be incomplete or incorrect and receive full credit.	

**Correct Answer:**

**Note:** students are allowed to use various reasonable values of pi for full credit, including 3.14, calculator key values, and  $\frac{22}{7}$ .

**Part A:** The volume of the first cylinder is three times the volume of the second cylinder.

OR

The volume of the second cylinder is one-third the volume of the first cylinder.

Explanation:

$$\text{Volume of First Cylinder: } V_{1st} = (3.14) \left( \frac{4}{2} \right)^2 9 = 113.04$$

$$\text{Volume of Second Cylinder: } V_{2nd} = (3.14) \left( \frac{4}{2} \right)^2 3 = 37.68$$

$$\frac{V_{1st}}{V_{2nd}} = \frac{113.04}{37.68} = 3$$

OR

$$\text{The second cylinder's volume} = 3.14 (2)^2 (3)$$

$$\text{The first cylinder's volume} = 3.14 (2)^2 (9)$$

If I divide one by the other, pi and  $r^2$  divide out, and I get  $\frac{3}{9} = \frac{1}{3}$ . The volume of the second cylinder is a third of the first.



OR

similar explanation

**Part B:** The diameter of the first cylinder is two times the diameter of the third cylinder.

OR

The diameter of the third cylinder is one-half the diameter of the first cylinder.

Explanation:

$$\text{Volume of First Cylinder: } V_{1st} = (3.14) \left( \frac{4}{2} \right)^2 9$$

$$\text{Volume of Third Cylinder: } V_{3rd} = \frac{1}{4} (3.14) (r)^2 9$$

$$\frac{V_{1st}}{V_{3rd}} = 4 \rightarrow \frac{3.14 \left( \frac{4}{2} \right)^2 9}{3.14 (r)^2 9} = 4 \rightarrow \frac{4}{r^2} = 4 \rightarrow 4 = 4r^2 \rightarrow r^2 = \frac{4}{4} = 1 \rightarrow r = 1$$

The radius of the third cylinder is 1 inch so its diameter is 2 inches. The diameter of the first cylinder is 4 inches. Therefore, the diameter of the third cylinder is one-half the diameter of the first cylinder:  $\frac{2}{4} = \frac{1}{2}$ .

OR

I can use the volume formula for the first cylinder to find the radius of the third cylinder, multiply that by two to find the diameter, and then compare diameters.

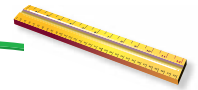
The volume of the first cylinder is four times that of the third cylinder.

$$3.14 (2)^2 (9) = 4 (3.14) (x)^2 (9)$$

$$4 = 4 (x)^2$$

$x = 1$ , so the diameter of the third cylinder = 2 and 2 is  $\frac{1}{2}$  of 4.

OR similar explanation



## GRADE 8 — Mathematics

## Annotated Student Response

## SAMPLE 2-POINT RESPONSE

NOTE: This is not a student response

1. A.  $V = \pi r^2 h$  DIAMETER = 4  $\rightarrow r = 2$

$$V_1 = \pi (2^2) 9 = 113.1$$

$$V_2 = \pi (2^2) 3 = 37.7$$

$$\frac{V_1}{V_2} = \frac{113.1}{37.7} = 3$$

THE VOLUME OF THE FIRST CYLINDER IS 3 TIMES THE VOLUME OF THE SECOND CYLINDER.

B.

$$V_3 = \frac{1}{4} V_1 = \frac{1}{4} (113.1) = 28.28$$

$$28.28 = \pi (r_3^2) 9 = 28.28 (r_3^2)$$

$$\frac{28.28}{28.28} = r_3^2 = 1$$

$$r_3^2 = 1 \rightarrow r_3 = 1$$

$$D_3 = 2r_3 \rightarrow D_3 = 2$$

$$D_3 \text{ is } \frac{1}{2} D_1$$

## ANNOTATION — 2-POINT RESPONSE

The student completes all components of the question and communicates ideas clearly.

Part A: The student provides a correct answer “The volume of the first cylinder is 3 times the volume of the second cylinder” and uses the formula for the volume of a cylinder to explain his answer.

Part B: The student provides a correct answer “ $D_3$  is  $\frac{1}{2} D_1$ ” and uses a correct process, dividing the volume of the first cylinder by 4 and then using the formula for volume of a cylinder to determine that the radius of the third cylinder is 1. The radius is then multiplied by 2 to find the diameter of 2 which is  $\frac{1}{2}$  of the diameter of the first cylinder.

Overall, the student earns 2 points.



## Annotated Student Response

### SAMPLE 1-POINT RESPONSE

1. A) The vol<sup>u</sup> of the first cylinder compares to the second by its 75.36 larger  
 $\pi 2^2(9) = 113.04 \text{ in}^3$  that the second cylinder.

Cylinder 1  
 $\pi 2^2(3) = 37.68$

Cylinder 2

B) How the diameter of the 3<sup>rd</sup> cylinder compares to the first cylinder's  
is. The diameter of the first cylinder is twice that of the  
third cylinders.

#### ANNOTATION — 1-POINT RESPONSE

The student demonstrates a partial understanding of the concepts and processes.

Part A: The student provides a correct answer “the first cylinder compares to the second by its 75.36 larger than the second cylinder” and uses the formula for the volume of a cylinder to determine the volumes of each “Cylinder 1  $\pi 2^2(9) = 113.04 \text{ in}^3$ , Cylinder 2  $\pi 2^2(3) = 37.68$ ”.

Part B: The student provides a correct answer of “The diameter of the 3<sup>rd</sup> cylinder is twice that of the third cylinders” but fails to explain his answer or show how this answer was determined.

**Overall**, the student earns 1 point.

## Annotated Student Response

## SAMPLE 0-POINT RESPONSE

1. There both the same because the height of them are both odd and the diameter for them both is 4 inches.

The diameter of the third cylinder is 1 inches because the first cylinder diameter was 4 inches, and the third cylinder is  $\frac{1}{4}$  of the first cylinder.

### ANNOTATION – 0-POINT RESPONSE

The student's answer is totally incorrect.

Part A The student provides an incorrect comparison of the two cylinders, “*There both the same because the hieght of them are both odd and the diameter for them both is 4 inches.*”

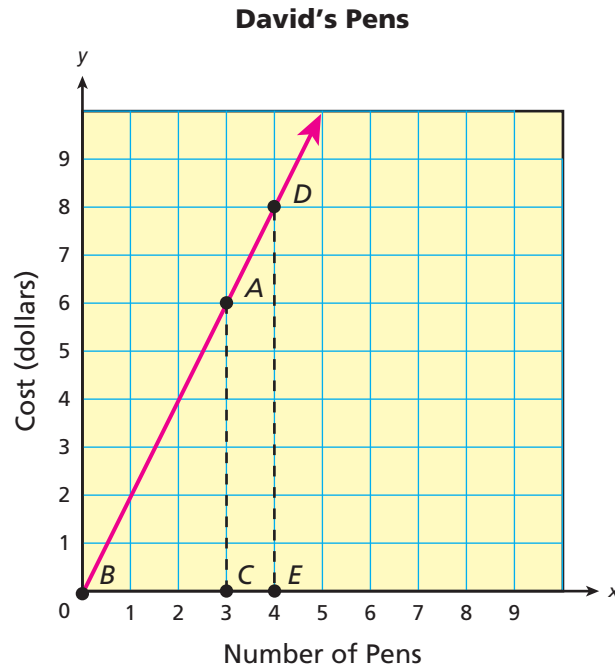
Part B The student provides an incorrect answer and explanation, “*The diameter of the third cylinder is 1 inches because the first cylinder diameter was 4 inches and the third cylinder is  $\frac{1}{4}$  of the first cylinder.*”

**Overall**, the student earns 0 points.



7

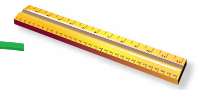
David wants to purchase some pens. The pens he likes cost \$2 each, not including tax. This is represented by the graph in the coordinate plane below.



**Part A** Write an equation for the graph of the line.

**Part B** Explain how similar triangles  $\triangle ABC$  and  $\triangle DBE$  formed by the graph, dashed lines, and  $x$ -axis are similar in relation to the number of pens purchased and the cost.





RUBRIC	
<b>Score Point 2</b>	<ul style="list-style-type: none"> <li>You complete all components of the question and communicate ideas clearly.</li> <li>You demonstrate an understanding of the concepts and/or processes.</li> <li>You provide a correct answer using an accurate explanation as support.</li> </ul>
<b>Score Point 1</b>	<ul style="list-style-type: none"> <li>You provide a partially correct answer to the question and/or address only a portion of the question.</li> <li>You demonstrate a partial understanding of the concepts and/or processes.</li> </ul>
<b>Score Point 0</b>	<ul style="list-style-type: none"> <li>Your answer is totally incorrect or irrelevant.</li> </ul>
<b>Blank</b>	<ul style="list-style-type: none"> <li>You did not give any answer at all.</li> </ul>
<b>Note:</b> No part can be incomplete or incorrect and receive full credit.	

**Correct Answer:**

**Part A:**  $y = 2x$

OR equivalent equation

**Part B:**

Note: the student may not necessarily use the slope to explain, but may correctly say there is a dilation of the triangles from the origin.

The triangles are similar because there is a constant rate of proportionality between  $\triangle ABC$  and  $\triangle DBE$ . The ratio of the horizontal and vertical sides also represent the slope of the side of each triangle that is part of line  $y = 2x$ .

$$\frac{AC}{BC} = \frac{6}{3} = 2 \quad \text{and} \quad \frac{DE}{BE} = \frac{8}{4} = 2$$

OR  
similar explanation



## Annotated Student Response

### SAMPLE 2-POINT RESPONSE

NOTE: This is not a student response

2.

Ⓐ  $y = 2x$

Ⓑ The height of each triangle, AC and DE, is always two times larger than the corresponding base, BC and BE. The base of the triangle corresponds to the Number of pens (x-axis) and the height of the triangle corresponds to the cost per pen (y-axis).  
 $\triangle ABC - 2(3) = 6$        $\triangle BDE - 2(4) = 8$

### ANNOTATION — 2-POINT RESPONSE

The student completes all components of the question and communicates ideas clearly.

Part A: Part A: The student provides a correct equation " $y = 2x$ ".

Part B: The student correctly explains how triangles ABC and DBE are similar in relation to the number of pens purchased and the cost "The height of each triangle, AC and DE, is always two times larger than the corresponding base, BC and BE. The base of the triangle corresponds to the number of pens (x-axis) and the height of the triangle corresponds to the cost per pen (y-axis)." The student then shows this relationship for each triangle, " $\triangle ABC$   $2(3) = 6$ ,  $\triangle BDE$   $2(4) = 8$ ."

**Overall**, the student earns 2 points.

## Annotated Student Response

2.

A.  $V = 2x$  will represent the graph David should use.

B. Both triangles have a constant rate of change.

**Overall**, the student earns 1 point.



## Annotated Student Response

### SAMPLE 0-POINT RESPONSE

2.	A. $A + B + C = DE$
	B. Same shape

#### ANNOTATION – 0-POINT RESPONSE

The student's answer is totally incorrect.

Part A The student provides an incorrect equation, " $A + B + C = DE$ ".

Part B The student provides an incorrect explanation, "*Same shape.*"

**Overall**, the student earns 0 points.



8

Vincent wants to have balloons delivered to a friend. He can choose between two stores.

- Store J charges \$70.00 for delivery, plus \$2.50 per balloon delivered.
- Store K charges \$60.00 for delivery, plus \$5.00 per balloon delivered.

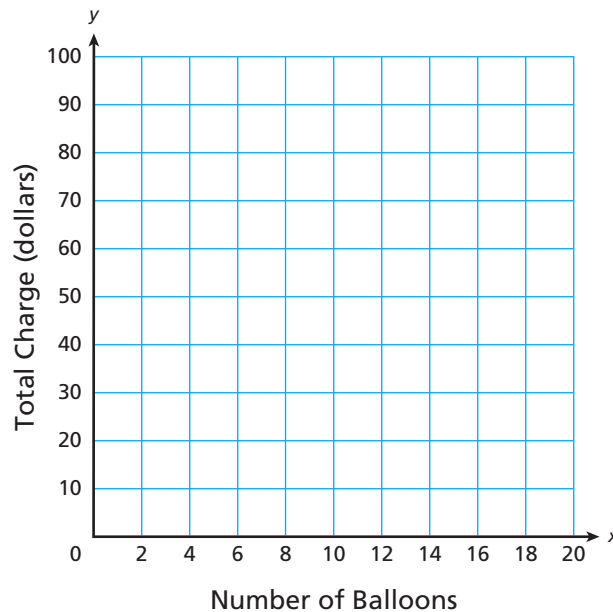
The equations below represent the charges at the two stores, where  $C$  represents the total charge for delivering  $b$  balloons.

$$C = 2.5b + 70$$

$$C = 5b + 60$$

**Part A** On your answer document, copy the coordinate plane below. Graph the two given equations on the coordinate plane. Estimate the solution using your graph.

**Two Balloon Stores**



**Part B** Solve the system of equations to algebraically verify the solution you graphed in **part A**.



RUBRIC

<b>Score Point 4</b>	Student scores 4 points.
<b>Score Point 3</b>	Student scores 3 – 3.5 points.
<b>Score Point 2</b>	Student scores 2 – 2.5 points.
<b>Score Point 1</b>	Student scores 0.5 – 1.5 points. OR Student demonstrates minimal understanding of solving systems of equations algebraically or graphically.
<b>Score Point 0</b>	Student's response is totally incorrect or irrelevant.
<b>Blank</b>	No student response.
<b>Note:</b> No part can be incomplete or incorrect and receive full credit.	

**Score Points**

<b>Part A:</b>	score 2 points	coordinate plane and both lines are graphed correctly with estimated solution
	OR	
	score 1.5 points	coordinate plane and one line graphed correctly
	OR	both lines graphed correctly with incomplete coordinate plane with estimated solution
	OR	
	score 1 point	one line graphed correctly with incomplete coordinate plane
<b>Part B:</b>	OR	
	score 0.5 point	some correct procedure
	score 2 points	correct answer with correct and complete work or explanation
	OR	
	score 1.5 points	correct answer with incomplete work or explanation
	OR	
	score 1 point	correct answer with no work or explanation
	OR	incorrect answer due to a calculation error (work must be shown)
	OR	
	score 0.5 point	some correct procedure

**Correct Answer:**

**Part A:** The student graphs both equations. One line should begin at 70 on the  $y$ -axis and have a slope of 2.5. The other line should begin at 60 on the  $y$ -axis and have a slope of 5. The graphs intersect at (4, 80).

**Part B:**  $2.5b + 70 = 5b + 60$ ;  $2.5b = 10$ ;  $b = 4$

The charge for both stores would be \$80.00 when 4 balloons are delivered.

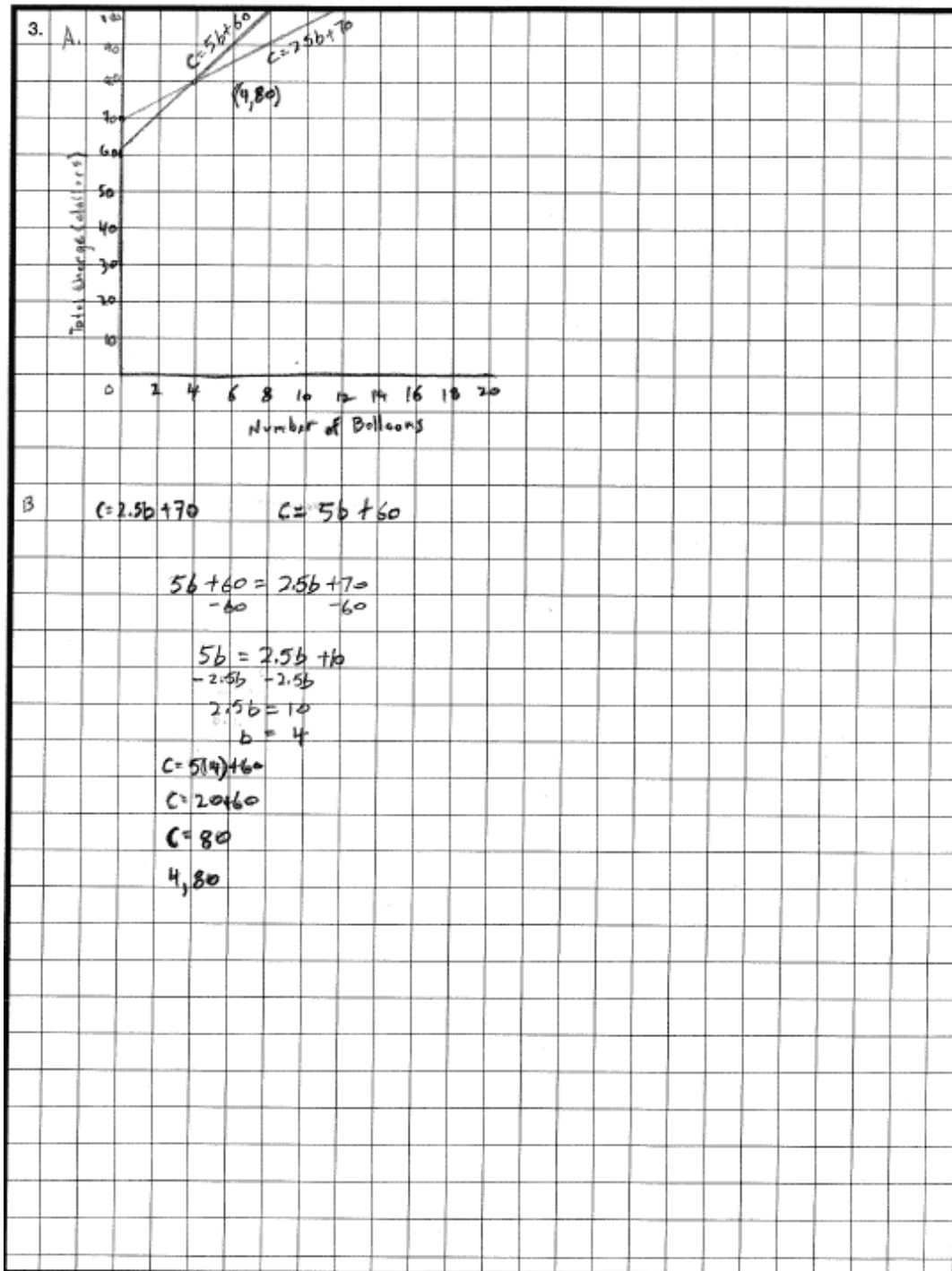
OR similar work



## Annotated Student Response

### SAMPLE 4-POINT RESPONSE

### NOTES



A

2.0

B

2.0



**GRADE 8 —Mathematics****ANNOTATION - 4-POINT RESPONSE**

A The student correctly copies the coordinate plane and correctly graphs both equations and labels the estimated solution  $(4, 80)$ . (2 points)

B The student correctly solves the system of equations algebraically: " $C = 2.5b + 70$ ,  $C + 5b = 60$ ,  $5b + 60 = 2.5b + 70$ " and then solves for b " $b = 4$ ". The student then substitutes 4 for b in one of the equations to solve for C, " $C = 5(4) + 60$ ,  $C = 80$ ". (2 points)

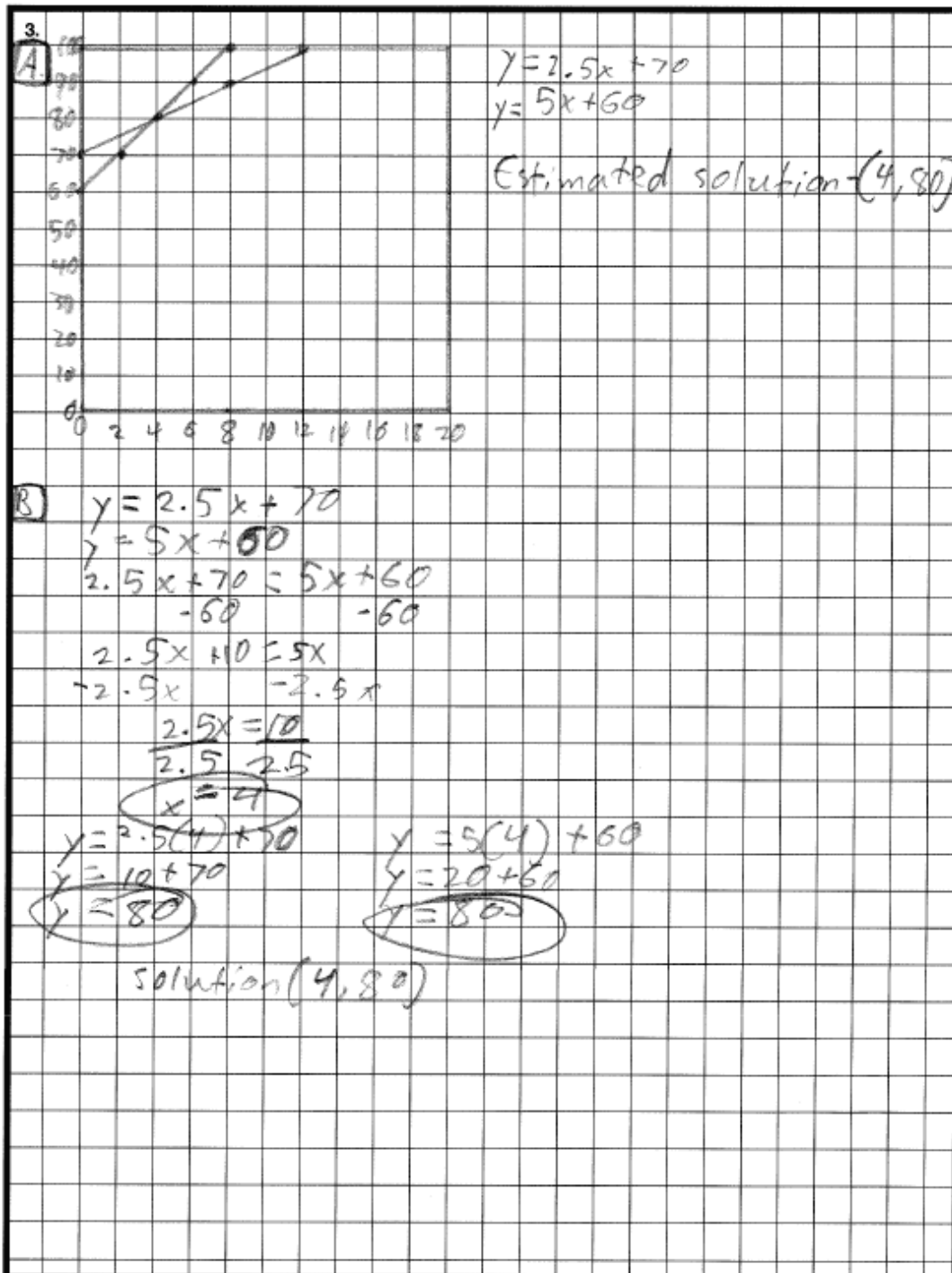
**Overall**, the student earns 4 points.



## Annotated Student Response

### SAMPLE 3-POINT RESPONSE

### NOTES



A

1.5

B

2.0

**GRADE 8 —Mathematics****ANNOTATION - 3-POINT RESPONSE**

A The student correctly graphs the two equations and has a correct estimated solution “(4,80)” but the coordinate plane is incomplete as it is missing labels for the x and y axis. (1.5 point)

B The student correctly solves the system of equations algebraically: “ $y = 2.5x + 70$ ,  $y + 5x = 60$ ,  $2.5x + 70 = 5x + 60$ ” and then solves for x “ $x = 4$ ”. The student then substitutes 4 for x in both of the equations to solve for y, “ $y = 2.5(4) + 70$ ,  $y = 10 + 70$ ,  $y = 80$ ” and “ $y = 5(4) + 60$ ,  $y = 20 + 60$ ,  $y = 80$ ”. (2 points)

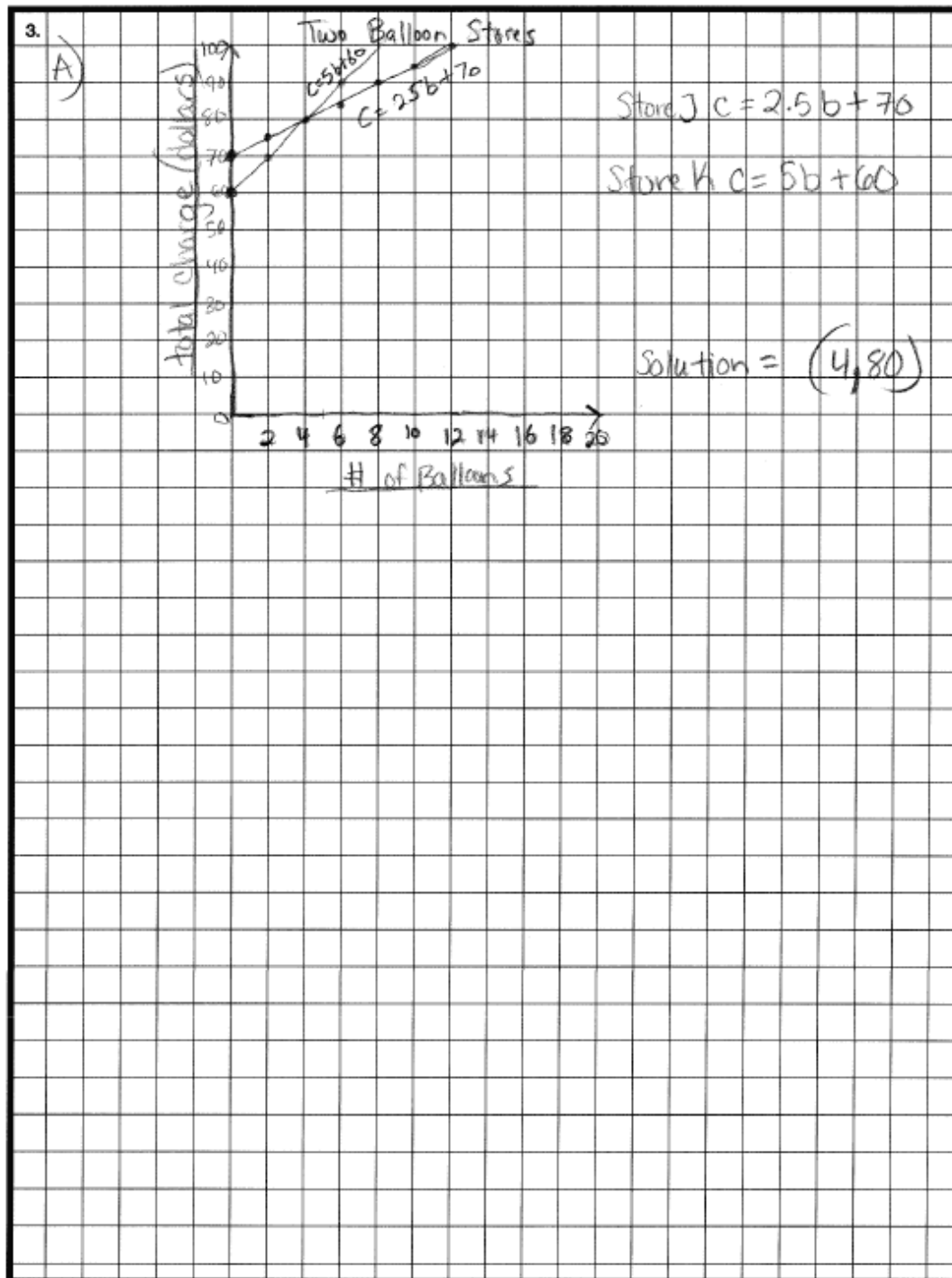
**Overall**, the student earns 3.5 points.



## Annotated Student Response

### SAMPLE 2-POINT RESPONSE

### NOTES

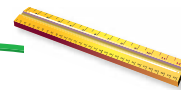


A

2.0

B

0

**GRADE 8 — Mathematics****ANNOTATION - 2-POINT RESPONSE**

A The student correctly copies the coordinate plane and correctly graphs both equations and labels the estimated solution  $(4, 80)$ . (2 points)

B Part B is not attempted. (0 points)

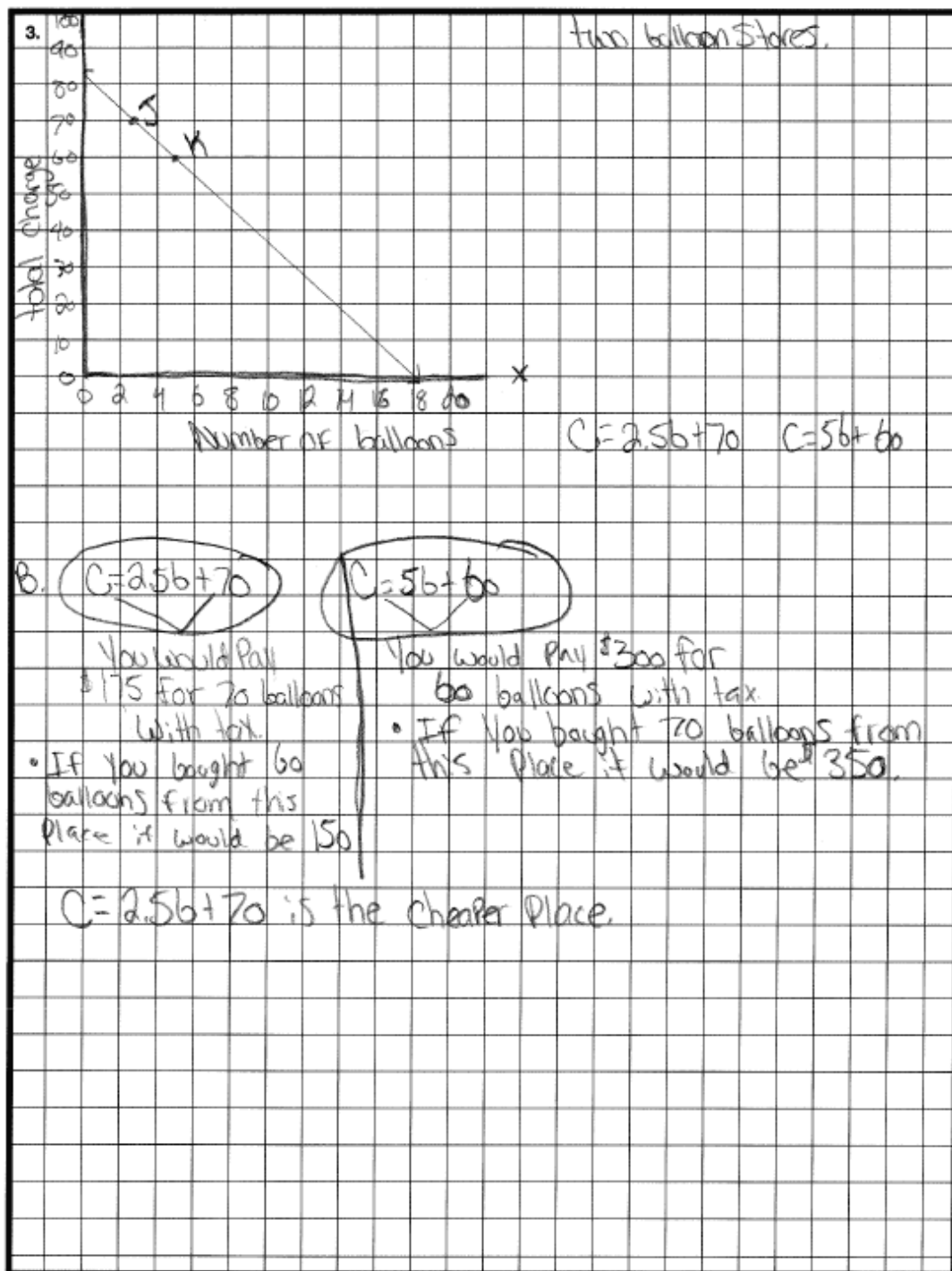
**Overall**, the student earns 2.0 points.



## Annotated Student Response

## SAMPLE 1-POINT RESPONSE

## NOTES



A

.5

B

0

**GRADE 8 — Mathematics****ANNOTATION - 1-POINT RESPONSE**

A The student demonstrates some correct procedure. The student correctly copies the coordinate plane. The student incorrectly graphs the two equations and fails to estimate the solution. (0.5 points)

B The student does not attempt to solve the system of equations algebraically. (0 points)

**Overall**, the student earns 0.5 points.



## Annotated Student Response

SAMPLE 0-POINT RESPONSE

NOTES

3. B. It shows on the graph that store K would be a better place to order balloons they charge \$5.00 store J charges \$75.00

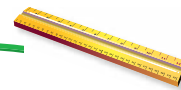
A

0.0

B

0.0



**GRADE 8 — Mathematics****ANNOTATION - 0-POINT RESPONSE**

- A The student does not attempt to copy the coordinate plane nor graph the two equations. (0 points)
- B The student does not attempt to solve the system of equations algebraically. (0 points)

**Overall**, the student earns 0 points.

### Item Information

Question Number	Key	DOK*	KCAS Primary Standard**
1	A	2	8.F.2
2	D	2	8.G.1.b
3	A	2	8.SP.2
4	B	3	8.EE.8.b
5	D	1	8.F.3
6	NA	2	8.G.9
7	NA	3	8.EE.6
8	NA	2	8.EE.8.b

\*DOK is the abbreviation for Depth of Knowledge. Please note that DOK is associated to the complexity level of an assessment item and is not aligned to the standard. Further information regarding DOK can be accessed on the Kentucky Department of Education Web site:  
<http://education.ky.gov/curriculum/docs/Pages/Content-Specific-Core-Content-for-Assessment-DOK-Support-Materials.aspx>

\*\*Further information regarding Common Core Standards can be accessed on the Common Core Web site:  
<http://www.corestandards.org>